Geophysical Research Abstracts
Vol. 14, EGU2012-5921, 2012
EGU General Assembly 2012

Mechanisms for decadal scale variability in the North Atlantic Ocean circulation in the Bergen Climate Model

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Potential mechanisms for decadal scale variability for the Atlantic Meridional Overturning Circulation (AMOC) and Subpolar Gyre strength have been identified from a 600-year pre-industrial control simulation with the Bergen Climate Model. In short, the variability appears rooted in the atmosphere. The three dominant modes of North Atlantic atmospheric variability – the North Atlantic Oscillation (NAO), the East Atlantic Pattern (EAP) and the Scandinavian Pattern (SP), are all reflected in the ocean circulation. The variable heat flux related to NAO drives convective mixing in the Labrador Sea and thus the formations of upper North Atlantic Deep Water. Negative phases of SP are associated with northerly winds and consequently increased water mass exchange across the Greenland-Scotland Ridge, including more overflow of lower North Atlantic Deep Water and more poleward heat transport with the Atlantic inflow. Finally, the variable deep water properties, together with the EAP, can partly explain the strength of the Subpolar Gyre circulation.